WHAT IS CLAIMED IS:

1. A control apparatus for a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion engine, the control apparatus comprising:

an exhaust purifying device disposed in an exhaust system of the internal combustion engine and operable to purify an exhaust gas while consuming a fuel; and

a controller that:

determines a first operating point at which a total fuel consumption amount is minimized as an optimal operating point, the total fuel consumption amount being obtained by adding an amount of a fuel consumed by the exhaust purifying device to an amount of a fuel consumed by the internal combustion engine for generating a required output; and

controls the engine load of the internal combustion engine and also controls a speed ratio of the continuously variable transmission so that the internal combustion engine operates at the optimal operating point.

2. The control apparatus according to claim 1, wherein the controller shifts the optimal operating point from the first operating point at which the total fuel consumption amount is minimized, to a second operating point on a higher-load, lower-speed side than the first operating point, or a third operating point on a lower-load, higher-speed side than the first operating point, depending upon an exhaust temperature of the internal combustion engine.

3. A control apparatus for a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion engine, the control apparatus comprising:

an exhaust purifying device disposed in an exhaust system of the internal combustion engine and operable to purify an exhaust gas while consuming a fuel; and

a controller that:

when the exhaust purifying device is not effectively functioning, places the internal combustion engine in an operating state that enables generation of a required torque while giving higher priority to reduction in an amount of a pollutant in the exhaust gas than to reduction in a fuel consumption amount; and

when the exhaust purifying device is effectively functioning, places the internal combustion engine in an operating state that enables generation of a required torque while giving higher priority to reduction in the fuel consumption amount to reduction in the amount of the pollutant in the exhaust gas.

4. The control apparatus according to claim 3, wherein:

when the exhaust purifying device is not effectively functioning, the controller sets, as a target operating point of the internal combustion engine, a point on a line that connects operating points having substantially the same ratio of a rate of change in the fuel consumption amount to a rate of change in the amount of the pollutant in the exhaust gas in a direction along an equi-output line of the internal combustion engine; and

when the exhaust purifying device is effectively functioning, the controller sets, as the target operating point, an operating point that is set based on an operating point at which a total fuel consumption amount is minimized, the total fuel consumption amount being obtained by adding an amount of a fuel consumed by the exhaust purifying device to an amount of a fuel consumed by the internal combustion engine for generating a required output.

5. A control apparatus for a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion engine, wherein the internal combustion engine is operated at an operating point defined by the engine load and the output speed, the control apparatus comprising:

a controller that:

sets, as a target operating point, an operating point selected from a plurality of operating points corresponding to a plurality of outputs of the engine, each of the plurality of operating points having substantially the same ratio of a rate of change in the fuel consumption amount to a rate of change in the amount of the pollutant in the exhaust gas, which ratio is obtained when an operating state of the engine is changed with an output of the engine being kept constant; and

places the internal combustion engine in an operating state represented by the target operating point set for a required output of the engine.

6. A control apparatus for a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion engine, wherein the internal combustion engine is operated at an operating point defined by the engine load and the output speed, the control apparatus comprising:

a controller that:

sets, as a target operating point, an operating point on a line on which an amount of a pollutant contained in an exhaust gas is substantially constant with respect to each output of the engine, when the internal combustion engine is in a low output state in which the amount of the pollutant emitted is equal to or smaller than a predetermined reference value; and

places the internal combustion engine in an operating state represented by the target operating point set for a required output of the engine.

7. A control apparatus for an internal combustion engine in which a catalyst adapted to remove a pollutant contained in an exhaust gas is provided in an exhaust system, the catalyst being adapted to store the pollutant and reduce and release the pollutant in the presence of a reducing agent, the control apparatus comprising:

a controller that reduces an excess air ratio of an air-fuel mixture to be burned in the internal combustion engine when the reducing agent is supplied to the catalyst.

8. The control apparatus according to claim 7, wherein the controller reduces the excess air ratio without changing an output of the internal combustion engine.

9. A control apparatus for an internal combustion engine that causes a first emission and a second emission to be generated upon combustion of a fuel, wherein an amount of the second emission in an exhaust gas increases as an operating state of the engine is changed so as to reduce an amount of the first emission in the exhaust gas, the control apparatus comprising:

a controller that:

determines an emission history of one of the first and second emissions during an operation of the internal combustion engine; and

changes the operating state of the internal combustion engine based on the determined emission history of the one of the first and second emissions.

10. A control apparatus for an internal combustion engine that causes a first emission and a second emission to be generated upon combustion of a fuel, wherein an amount of the second emission in an exhaust gas increases as an operating state of the engine is changed so as to reduce an amount of the first emission in the exhaust gas, and wherein an emission control device is provided in an exhaust passage so as to purify an exhaust gas by reducing at least one of the first emission and the second emission, the control apparatus comprising:

a controller that:

determines an emission control capability with which the

emission control device reduces an amount of one of the first emission and the second emission; and

changes an operating state of the internal combustion engine based on the determined emission control capability.

11. A control apparatus for an internal combustion engine that generates particulate matters upon combustion of a fuel, wherein an emission control device that controls emission of the particulate matters is provided in an exhaust passage, the control apparatus comprising:

a controller that:

determines whether the emission control device is in a predetermined clogged state in which the emission control device is at least partially clogged by the particulate matters; and

changes an operating state of the internal combustion engine so as to mitigate the clogged state of the emission control device when it is determined that the emission control device is in the predetermined clogged state.

12. A control apparatus for an internal combustion engine including an exhaust gas recirculation system adapted to return a part of an exhaust gas emitted upon combustion of a fuel to an intake side of the engine, the control apparatus comprising:

a controller that:

determines whether the exhaust gas recirculation system is in a predetermined clogged state; and

changes an operating state of the internal combustion engine so as to mitigate the clogged state of the exhaust gas recirculation system

when it is determined that the exhaust gas recirculation system is in the predetermined clogged state.

13. A method of controlling a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion engine, wherein an exhaust purifying device is disposed in an exhaust system of the internal combustion engine and is operable to purify an exhaust gas while consuming a fuel, comprising the steps of:

determining a first operating point at which a total fuel consumption amount is minimized as an optimal operating point, the total fuel consumption amount being obtained by adding an amount of a fuel consumed by the exhaust purifying device to an amount of a fuel consumed by the internal combustion engine for generating a required output; and

controlling the engine load of the internal combustion engine and also controlling a speed ratio of the continuously variable transmission so that the internal combustion engine operates at the optimal operating point.

14. The method according to claim 13, wherein the optimal operating point is shifted from the first operating point at which the total fuel consumption amount is minimized, to a second operating point on a higher-load, lower-speed side than the first operating point, or a third operating point on a lower-load, higher-speed side than the first operating point, depending upon an exhaust temperature of the internal combustion engine.

15. A method of controlling a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion engine, wherein an exhaust purifying device is disposed in an exhaust system of the internal combustion engine and is operable to purify an exhaust gas while consuming a fuel, comprising the steps of:

when the exhaust purifying device is not effectively functioning, placing the internal combustion engine in an operating state that enables generation of a required torque while giving higher priority to reduction in an amount of a pollutant in the exhaust gas than to reduction in a fuel consumption amount; and

when the exhaust purifying device is effectively functioning, placing the internal combustion engine in an operating state that enables generation of a required torque while giving higher priority to reduction in the fuel consumption amount to reduction in the amount of the pollutant in the exhaust gas.

16. The method according to claim 15, wherein:

when the exhaust purifying device is not effectively functioning, a target operating point of the internal combustion engine is set to a point on a line that connects operating points having substantially the same ratio of a rate of change in the fuel consumption amount to a rate of change in the amount of the pollutant in the exhaust gas in a direction along an equi-output line of the internal combustion engine; and

when the exhaust purifying device is effectively functioning, the target operating point is set to an operating point that is set based on an

operating point at which a total fuel consumption amount is minimized, the total fuel consumption amount being obtained by adding an amount of a fuel consumed by the exhaust purifying device to an amount of a fuel consumed by the internal combustion engine for generating a required output.

17. A method of controlling a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion engine, wherein the internal combustion engine is operated at an operating point defined by the engine load and the output speed, comprising the steps of:

setting, as a target operating point, an operating point selected from a plurality of operating points corresponding to a plurality of outputs of the engine, each of the plurality of operating points having substantially the same ratio of a rate of change in the fuel consumption amount to a rate of change in the amount of the pollutant in the exhaust gas, which ratio is obtained when an operating state of the engine is changed with an output of the engine being kept constant; and

placing the internal combustion engine in an operating state represented by the target operating point set for a required output of the engine.

18. A method of controlling a vehicle including an internal combustion engine capable of controlling an engine load, and a continuously variable transmission coupled to an output side of the internal combustion engine and capable of controlling an output speed of the internal combustion

engine, wherein the internal combustion engine is operated at an operating point defined by the engine load and the output speed, comprising the step of:

setting, as a target operating point, an operating point on a line on which an amount of a pollutant contained in an exhaust gas is substantially constant with respect to each output of the engine, when the internal combustion engine is in a low output state in which the amount of the pollutant emitted is equal to or smaller than a predetermined reference value.

19. A method of controlling an internal combustion engine in which a catalyst adapted to remove a pollutant contained in an exhaust gas is provided in an exhaust system, the catalyst being adapted to store the pollutant and reduce and release the pollutant in the presence of a reducing agent, comprising the step of:

reducing an excess air ratio of an air-fuel mixture to be burned in the internal combustion engine when the reducing agent is supplied to the catalyst.

20. The method according to claim 19, wherein the excess air ratio is reduced without changing an output of the internal combustion engine.

21. A method of controlling an internal combustion engine that causes a first emission and a second emission to be generated upon combustion of a fuel, wherein an amount of the second emission in an exhaust gas increases as an operating state of the engine is changed so as to reduce an amount of the first emission in the exhaust gas, comprising the

steps of:

determining an emission history of one of the first and second emissions during an operation of the internal combustion engine; and

changing the operating state of the internal combustion engine based on the determined emission history of the one of the first and second emissions.

22. A method of controlling an internal combustion engine that causes a first emission and a second emission to be generated upon combustion of a fuel, wherein an amount of the second emission in an exhaust gas increases as an operating state of the engine is changed so as to reduce an amount of the first emission in the exhaust gas, and wherein an emission control device is provided in an exhaust passage so as to purify an exhaust gas by reducing at least one of the first emission and the second emission, comprising the steps of:

determining an emission control capability with which the emission control device reduces an amount of one of the first emission and the second emission; and

changing an operating state of the internal combustion engine based on the determined emission control capability.

23. A method of controlling an internal combustion engine that generates particulate matters upon combustion of a fuel, wherein an emission control device that controls emission of the particulate matters is provided in an exhaust passage, comprising the steps of:

determining whether the emission control device is in a predetermined clogged state in which the emission control device is at least

partially clogged by the particulate matters; and

changing an operating state of the internal combustion engine so as to mitigate the clogged state of the emission control device when it is determined that the emission control device is in the predetermined clogged state.

24. A method of controlling an internal combustion engine including an exhaust gas recirculation system adapted to return a part of an exhaust gas emitted upon combustion of a fuel to an intake side of the engine, comprising the steps of:

determining whether the exhaust gas recirculation system is in a predetermined clogged state; and

changing an operating state of the internal combustion engine so as to mitigate the clogged state of the exhaust gas recirculation system when it is determined that the exhaust gas recirculation system is in the predetermined clogged state.